

Local Assistance Webinar

State of Good Repair Project Selection Process

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Structure and Bridge Division August 26, 2016

Prioritization Formula

Why?



Recent Developments

- ➤ MAP-21 and FAST Act
- > HB1887 (State of Good Repair)
- > AASHTO Elements
- Sunset of Pontis 4.4

Responsibility for Funding and Performance for Local Bridges



MAP-21 and **FAST** Act

- Condition Performance Measures Apply to All of Virginia's Bridges
 - > Structurally Deficient Deck Area
 - Percentage of Bridges in Good Condition
 - Percentage of Bridges in Poor Condition
 - We are going to be partially responsible for local bridges
- > Asset Management Plan Must Include:
 - > Risk
 - > Condition
 - Life Cycle Analysis
- > AASHTO Elements
 - > Localities are now required to report element data



What is the State of Good Repair?

- Dedicated Funding to Address Deficient Bridges and Pavements
- > Funds Distributed to VDOT and Localities
 - The State of Good Repair is NOT a Maintenance Program
 - The State of Good Repair is NOT Strictly for Bridge Replacements
 - Bridges and Projects are Selected Through Formula per the CTB



General Prioritization Formula

Priority Rank =

- 30% Importance
- + 25% Condition
- + 15% Design Redundancy (risk)
- + 10% Structure Capacity (Clearances, Posting)
- + 20% Cost-Effectiveness

Max Score = 1.0

Min Score = 0.0

All five variables have a 0 to 1.0 scale and are dimensionless



Description of Variables – Importance Factor

IF: Importance Factor.

Measures *relative* importance of the structure to the roadway network

Uses these variables:

- Traffic
- Truck traffic
- Proximity to schools, hospitals and emergency facilities
- Detour vs. traffic
- Functional class of roadway
- Predicted future ADT growth

Importance Factor is the subject of a paper published by the Virginia Transportation Research Council. Closed bridges are assigned an Importance Factor of zero



Description of the Variables - Condition

Condition is measured using the Modified Health Index (MHI)*

Condition = 1 – MHI



^{*} Modified Health Index is based on element data. If data are not available, Condition is based on a weighted average of the structure's General Condition Ratings

Tying Condition to Value The "Modified Health Index"

Equity = MHI * Structure Replacement Cost

Example Structure:

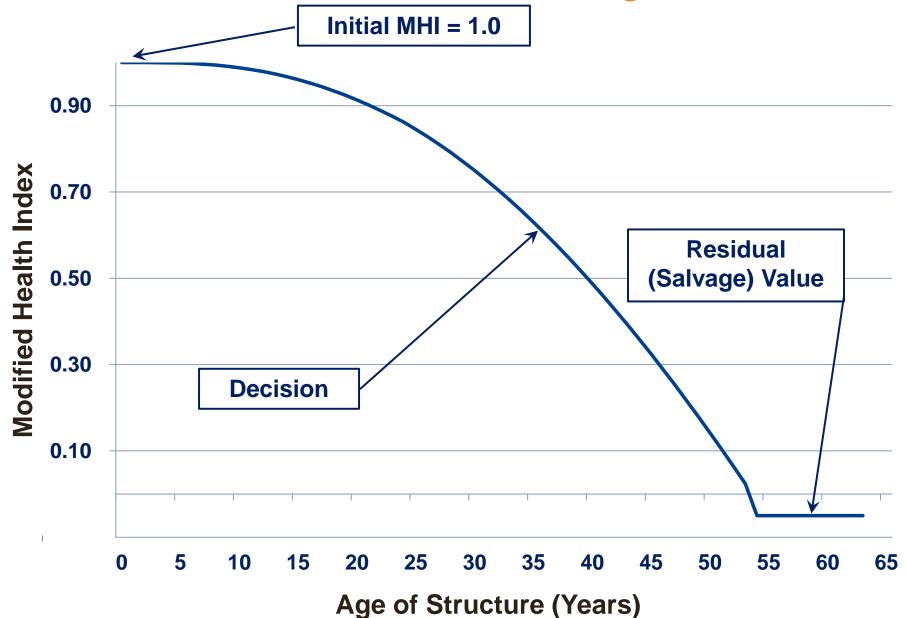
MHI= .32

Replacement Value = \$1,000,000

Equity = .32 * 1,000,000 = \$320,000



Modified Health Index – Variation with Age of Structure



DRF = Design Redundancy Factor (Risk)

DRF = Part A + Part B \leq 1.0

Part A

- = 0.75 if one of Scour Critical or Fracture Critical exists
- = 0.90 if both of Scour Critical or Fracture Critical exists

Part B

- = 0.10 if one of Seismic Critical or Fatigue Prone Details exists
- = 0.20 if both of Seismic Critical or Fatigue Prone Details exists



SCF = Structure Capacity Factor (Function)

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SCF = 40% (Weight Reduction Factor)
+ 30% (Waterway/Vertical Clearance Factor)
+ 30% (Deck Width Factor)
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- Weight Reduction Factor (WRF) = 0 to 1.0 score measuring ability of structure to carry Fire Trucks, Ambulances, School Buses and Design Vehicles
- Waterway/Vertical Clearance Factor = 0 to 1.0 score measuring the adequacy of vertical clearance for waterways, railways and trucks
- Deck Width Factor = 0 to 1.0 score measuring adequacy of deck width vs need

The Weight Reduction Factor is the subject of a paper published through the Virginia Transportation Research Council



CEF = Cost-Effectiveness Factor

CEF = a function of the ratio of Repair Cost (RC) to Structure Replacement Cost (SRC)

CEF = -2(RF/SRC) + 1.3, Max 1.00, Min 0.00

Where:

RF = Requested Funds

SRC = Structure Replacement Cost: Uses Bridge Management System estimates



Example Initial Prioritization List for Bristol District

10%

Local Input Required

Replace Superstructure and Repair Substructure

Box Beams, Parapets & Box Beams, Repair Sub

Replace Superstructure and Repair Substructure

Remove & Replace Overlay, Reseal Joints, Waterproof

Replace Superstructure and Repair Substructure: 1885

Replace Deck, Repair & Recoat Structural Steel, Repair

SD - Structural Evaluation

SD - Structural Evaluation

Culture Resoure Review

SD - Structural Evaluation

SD - Structural Evaluation

SD - Waterway Adequacy

SD - Structural Evaluation

SD - Structural Evaluation

Replace Bridge

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537,489

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657,960

745,997

\$ 1,190,816

\$ 3,519,934

\$ 3,553,913

\$ 2,024,850

\$ 1,386,968

\$ 1.807.847

\$ 4,454,361

\$ 2,276,605

\$ 4,560,932

\$ 1.871.944

\$ 3,750,065

\$ 3,506,033

\$ 4,689,126

\$ 1,363,028

\$ 1,081,928

\$ 4,482,162

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711,246

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O BLUE STONE ROAD

O MAIN AVENUE SW

61 EAST RIVERSIDE DR

0 EAST CHILHOWIE ST

O TAZEWELL AVENUE

2435 Dan Branch Rd

O PISGAH ROAD

5105 Central Shop Rd.

2163 Highland Rd

3053 Big John Stacey Rd

23 US23(GILLEY AVE.E)

O GOODSON STREET

O GOV. PLANT ROAD

O HOCKMAN PIKE

O OAK STREET

2070 Woodcrest Rd

5130 Turndown Rd.

4261 Bright Leaf Rd.

O STATE STREET

O M.L.K. JR. BLVD.

O ALLEGHENY ST.

16 FAIRGROUND ROAD

O PRIVATE ENTRANCE

4062 RainesSch.HollowRd

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5417 Bob Casey Rd.

Bridge Federal ID	Sys	City or County Name	Route No.	Facility	Open Posted Closed	Deck GCR	Super Structu re	Sub Structu re	Culv GCR	Importance Factor (Percentile Rank)	Condition Factor (Percentile Rank)	(Formula	Factor (Percentile	(Formula	nt SGR Score	Recommended Action Cost *	Recommended Action Description	Structure Replacement Cost**
22467	Р	Richlands	460	FRONT STREET	Α	4	4	5	N	0.79	0.65	0.00	0.25	0.89	0.603	\$ 1,726,845	Replace Deck& Bearings, Repair Structural Steel, Repair	\$ 8,453,865
29785	U	Buchanan	3310	Mott Branch Rd.	Р	6	6	4	N	0.50	0.18	0.75	0.73	1.00	0.581	\$ 80,850	Remove Asphalt Overlay, Reseal Longitudinal Joints, Waterproof Tops of Box Beams, Place New Asphalt	\$ 1,342,177
19974	U	Bristol	0	FAIRVIEW ST.	Α	5	4	5	N	0.73	0.46	0.00	0.09	1.00	0.543	\$ 232,256	Mill/Patch/Rigid Overlay Deck, Waterproof Sidewalks,	\$ 2,629,525
22546	Р	Tazewell	19	RTE.19 & 460 BUS.	Α	5	4	4	N	0.46	0.75	0.00	0.38	0.74	0.511	\$ 937,627	Replace Superstructure and Repair Substructure	\$ 3,323,781
29794	U	Buchanan	4025	Curve Hollow Rd.	Р	5	5	4	N	0.52	0.57	0.75	0.72	0.00	0.483	\$ 581,504	Replace Bridge	\$ 581,507
22548	Р	Tazewell	61	ROUTE 61	Α	4	5	5	N	0.81	0.41	0.00	0.36	0.47	0.476	\$ 1,434,541	Replace Superstructure and Repair Substructure	\$ 3,472,054
22542	Р	Tazewell	16	WEST RIVERSIDE DR.	P	4	4	4	N	0.66	0.82	0.00	0.70	0.00	0.473	\$ 3,323,781	Replace Bridge	\$ 3,323,781
19965	U	Big Stone Gap	0	SHAWNEE AVE. WEST	P	4	3	4	N	0.09	0.96	0.75	0.92	0.00	0.472	\$ 3,129,173	Replace Bridge	\$ 3,129,173
29712	U	Buchanan	3050	Booth Branch Rd.	P	6	5	3	N	0.33	0.65	0.75	0.95	0.00	0.469	\$ 1,179,226	Replace Bridge	\$ 1,179,232
29744	U	Buchanan	2080	Jackson Rd.	P	5	4	5	N	0.52	0.46	0.00	0.79	0.56	0.462	\$ 224,243	Replace Superstructure and Repair Substructure	\$ 606,992
29702	U	Buchanan	3137	Sugar Bend Rd.	P	5	5	5	N	0.61	0.27	0.75	0.95	0.00	0.458	\$ 822,451	SD - Structural Evaluation	\$ 822,451
29803	U	Buchanan	4263	Campground Rd.	P	6	5	4	N	0.68	0.34	0.75	0.52	0.00	0.454	\$ 1,080,378	Replace Bridge	\$ 1,080,383
29808	U	Buchanan	4245	Monroe Rd.	P	6	4	5	N	0.56	0.30	0.00	0.85	0.59	0.445	\$ 395,484	Replace Superstructure and Repair Substructure	\$ 1,109,729
22543	Р	Tazewell	16	WEST RIVERSIDE DR.	Р	5	4	7	N	0.63	0.12	0.00	0.20	1.00	0.439	\$ 357,810	Mill/Patch/Place Rigid Overly Deck, Replace Bearings, Repair & Recoat Structural Steel	\$ 4,050,472
22469	Р	Richlands	67	2ND STREET	Α	4	6	6	N	0.74	0.10	0.00	0.25	0.83	0.438	\$ 2,032,794	Replace Deck, Recoat Structural Steel, Repair	\$ 8,633,800
29731	U	Buchanan	2078	Staggerweed Rd.	P	5	4	6	N	0.64	0.24	0.00	0.87	0.48	0.435	\$ 333,082	Replace Superstructure and Repair Substructure	\$ 814,728
20001	U	Bristol	0	PIEDMONT AVE.	Р	4	4	4	N	0.31	0.82	0.75	0.18	0.00	0.429	\$ 45,312,003	Replace Bridge	\$ 45,312,003

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Replace Superstructure and Repair Substructure

Replace Superstructure and Repair Substructure

Replace Superstructure and Repair Substructure

Replace Deck, Recoat Structural Steel, Repair

Replace Superstructure and Repair Substructure

Box Beams, Parapets & Box Beams, Repair Sub

Replace Superstructure and Repair Substructure

Remove & Replace Overlay, Reseal Joints, Waterproof

Replace Superstructure and Repair Substructure: 1885

Replace Deck, Repair & Recoat Structural Steel, Repair

Mill/Patch/Place Rigid Overly Deck, Replace Bearings,

Replace Bridge

711.246 SD - Structural Evaluation

SD - Structural Evaluation

SD - Structural Evaluation

SD - Structural Evaluation

Culture Resoure Review

SD - Structural Evaluation

SD - Structural Evaluation

SD - Waterway Adequacy

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Repair & Recoat Structural Steel

Structure Replacement Cost** \$ 8,453,865 \$ 1,342,177 \$ 2,629,525 \$ 3,323,781 581,507

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	Grey ricids are objective inventory and condition																
	Data from Localities and VDOT Information Systems																
BRISTO	DIST	RICT			General Condition Rating			30%	6 25% 15% 10% 20% Lo			Local Input Required					
Bridge Federal ID	Sys	City or County Name	Route No.	Facility	Open Posted Closed	I GCR	Super Structu re	Structu re	Culv	Importance Factor (Percentile Rank)	Condition Factor (Percentile Rank)	Redundancy	Structure Capacity Factor (Percentile Rank)	(Formula	nt SGR Score	Recommended	Recommended Action Description
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29785	U	Buchanan	3310	Mott Branch Rd.	Р	6	6	4	N	0.50	0.18	0.75	0.73	1.00	0.581	\$ 80,850	Remove Asphalt Overlay, Reseal Longitudinal Joints, Waterproof Tops of Box Beams, Place New Asphalt
19974	U	Bristol	0	FAIRVIEW ST.	Α	5	4	5	N	0.73	0.46	0.00	0.09	1.00	0.543	\$ 232,256	Mill/Patch/Rigid Overlay Deck, Waterproof Sidewalks,
22546	Р	Tazewell	19	RTE.19 & 460 BUS.	Α	5	4	4	N	0.46	0.75	0.00	0.38	0.74	0.511	\$ 937,627	Replace Superstructure and Repair Substructure
29794	U	Buchanan	4025	Curve Hollow Rd.	Р	5	5	4	N	0.52	0.57	0.75	0.72	0.00	0.483	\$ 581,504	Replace Bridge

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2164 Route 2164

5417 Bob Casey Rd.

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O MAIN AVENUE SW

61 EAST RIVERSIDE DR

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4263 Campground Rd.

16 WEST RIVERSIDE DR

16 WEST RIVERSIDE DR.

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BRISTOL DISTRICT						Gen	General Condition Rating				6 25% 15% 10% 20% L				Local Input Required		
Bridge Federal ID	Ė	City or County Name		Facility	Oper Poste Close	d GCR	Super Structu re	Sub Structu re	Culv	Importance Factor (Percentile Rank)	Factor (Percentile	Factor	Structure Capacity Factor (Percentile Rank)		nt SGR Score	Recommended Action Cost *	Recommended Action Description
22467	Р	Richlands	460	FRONT STREET	Α	4	4	5	N	0.79	0.65	0.00	0.25	0.89	0.603	\$ 1,726,845	Replace Deck& Bearings, Repair Structural Steel, Repair
29785	U	Buchanan	3310	Mott Branch Rd.	Р	6	6	4	N	0.50	0.18	0.75	0.73	1.00	0.581	\$ 80,850	Remove Asphalt Overlay, Reseal Longitudinal Joints,

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0.392 \$

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822.451

395,484

357.810

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174.442

701,979

657,957

745,997

344,569

394,998

570.693

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413.875

500,342

881,914

229,233

481.587

0.469 \$ 1,179,226

0.438 \$ 2,032,794

0.429 \$ 45,312,003

0.400 \$ 3,519,934

0.399 \$ 1,371,734

0.381 \$ 1,386,961

0.381 \$ 1.807.837

0.359 \$ 4.454.361

0.350 \$ 2,276,593

0.309 \$ 3.750.065

0.305 \$ 3,506,033

0.284 \$ 2,510,806

0.227 \$ 1.081.922

0.204 \$ 4.482.139

\$

0.350

0.312 \$

0.311 \$

0.296 \$

0.250 S

0.198 \$

0.150 S

0.473 \$ 3.323.781 Replace Bridge

0.472 \$ 3,129,173 Replace Bridge

0.454 \$ 1,080,378 Replace Bridge

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Structure

Replacement

Cost**

\$ 8,453,865

\$ 1,342,177

\$ 2,629,525

\$ 3,323,781

\$ 581,507

\$ 3,472,054

\$ 3,323,781

\$ 3,129,173

\$ 1,179,232

\$ 1,080,383

\$ 1,109,729

\$ 4,050,472

\$ 8,633,800

\$ 45,312,003

\$ 1,190,816

\$ 3,519,934

\$ 3,553,913

\$ 2,024,850

\$ 1,386,968

\$ 1,807,847

\$ 4,454,361

\$ 2,276,605

\$ 4,560,932

\$ 1,871,944

\$ 3,750,065

\$ 3,506,033

\$ 4,689,126

\$ 1,363,028

\$ 1,081,928

\$ 4,482,162

657,960

711.246

881,914

542,895

669,544

570,696

705,068

878,053

537,489

701,979

657,960

745,997

606,992

822,451

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Waterproof Tops of Box Beams, Place New Asphalt

Replace Superstructure and Repair Substructure

Replace Superstructure and Repair Substructure

Replace Deck, Recoat Structural Steel, Repair

Replace Superstructure and Repair Substructure

Box Beams, Parapets & Box Beams, Repair Sub

Replace Superstructure and Repair Substructure

Remove & Replace Overlay, Reseal Joints, Waterproof

Replace Superstructure and Repair Substructure: 1885

Replace Deck, Repair & Recoat Structural Steel, Repair

Mill/Patch/Place Rigid Overly Deck, Replace Bearings,

232,256 Mill/Patch/Rigid Overlay Deck, Waterproof Sidewalks,

937,627 Replace Superstructure and Repair Substructure

Replace Bridge

657,960 SD - Structural Evaluation

711.246 SD - Structural Evaluation

669,541 Replace Bridge

0.476 \$ 1,434,541 Replace Superstructure and Repair Substructure

SD - Structural Evaluation

SD - Structural Evaluation

SD - Structural Evaluation

Culture Resoure Review

SD - Structural Evaluation

SD - Structural Evaluation

SD - Waterway Adequacy

Repair & Recoat Structural Steel

19974

22546

29794

22548

22542 Р Tazewell

19965

29712

29744

29702 U

29803 U

29808

22543 Р Tazewell

22469

29731

20001

30534

29801

29759 U

29696 U

22441

20608

22423

29679

29739

22539

29711 U

29685 U

29760 U

19968

19971

22611

22425

29793

26766

29721

20004

22461

29818

22544 Р Tazewell

29802

U Norton

22547 P Tazewell

U Bristol

P Tazewell

U Buchanan

P Tazewell

U Big Stone Gap

Buchanan

Buchanan

U Buchanan

U Buchanan

U Buchanan

P Richlands

U Buchanan

O Buchanan

U Buchanan

U Marion

U Bluefield

U Tazewell

U Buchanan

Buchanan

Buchanan

Buchanan

P Big Stone Gap

U Tazewell

U Bristol

U Saltville

U Bluefield

U Buchanan

U Buchanan

U Richlands

U Buchanan

U Buchanan

30533 U Buchanan

U Bristol

U Bristol

19982 U Bristol

Buchanan

Buchanan

U Bristol

O FAIRVIEW ST.

4025 Curve Hollow Rd.

3050 Booth Branch Rd.

61 ROUTE 61

2080 Jackson Rd.

4245 Monroe Rd.

67 2ND STREET

2078 Staggerweed Rd.

O PIEDMONT AVE.

1030 W.P.Harris Rec.Pk

2164 Route 2164

5417 Bob Casey Rd.

O BLUE STONE ROAD

O MAIN AVENUE SW

61 EAST RIVERSIDE DR.

0 EAST CHILHOWIE ST

O TAZEWELL AVENUE

O FINCASTLE FARM RD

2435 Dan Branch Rd

O PISGAH ROAD

5105 Central Shop Rd.

2163 Highland Rd.

3053 Big John Stacey Rd

23 US23(GILLEY AVE.E)

O GOODSON STREET

O GOV. PLANT ROAD

O HOCKMAN PIKE

O OAK STREET

2070 Woodcrest Rd.

5130 Turndown Rd.

4261 Bright Leaf Rd

O STATE STREET

O M.L.K. JR. BLVD.

O ALLEGHENY ST.

16 FAIRGROUND ROAD

O PRIVATE ENTRANCE

4062 RainesSch.HollowRd

3137 Sugar Bend Rd

4263 Campground Rd

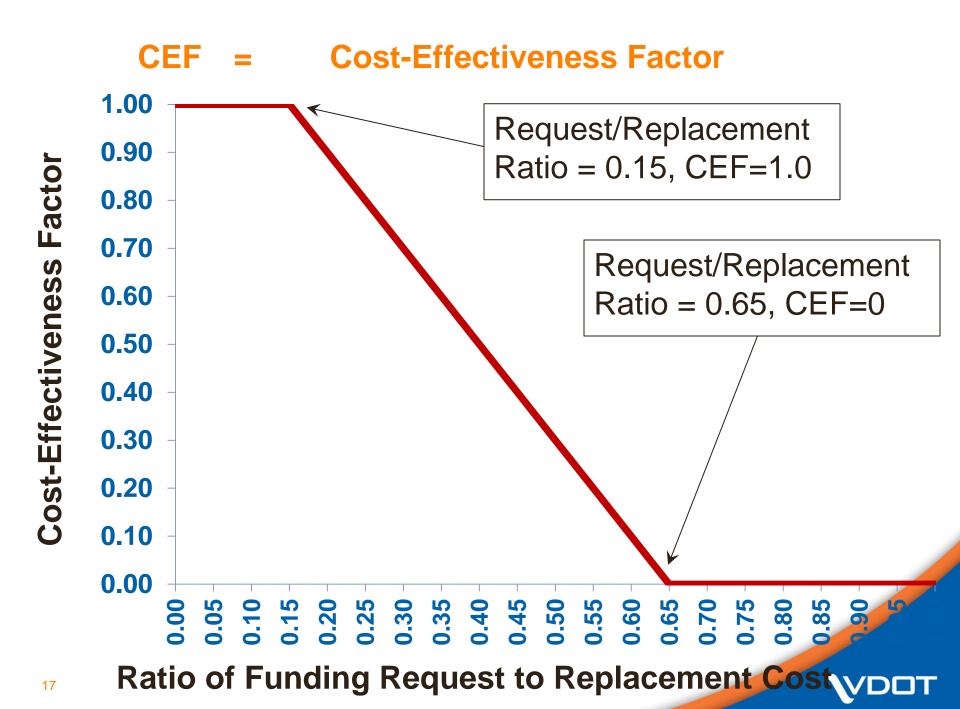
16 WEST RIVERSIDE DR

19 RTE.19 & 460 BUS.

16 WEST RIVERSIDE DR.

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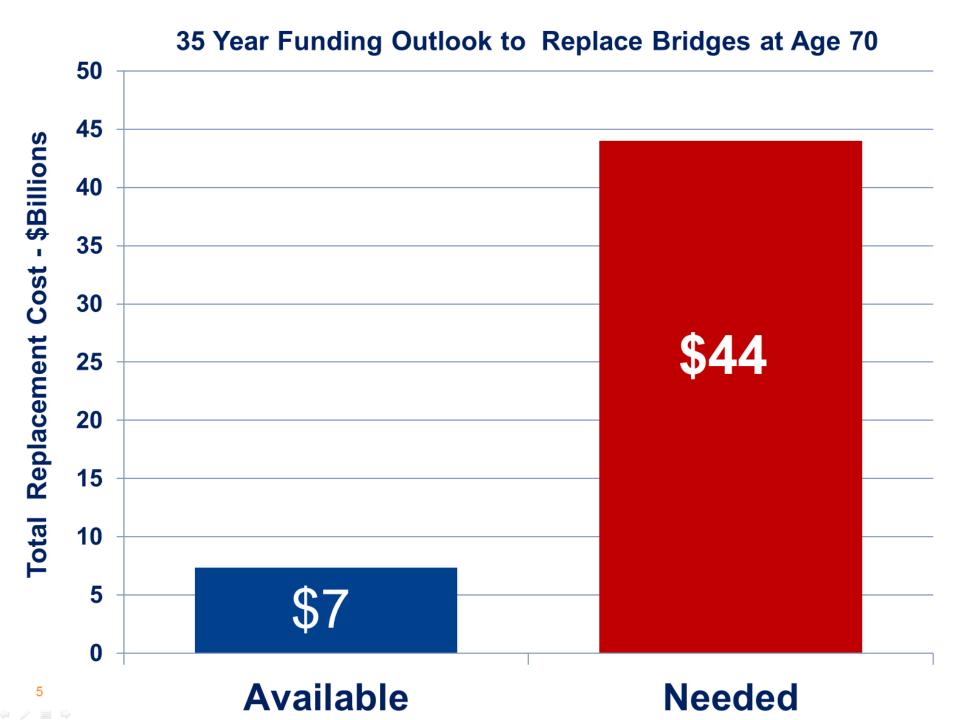


- Agreement from of the District Bridge Engineer is required if the proposed scope and estimate vary significantly from that recommended by the Bridge Management System
- Localities are highly encouraged to investigate their bridges now and follow VDOT guidelines
- District Bridge Engineers are a resource that can help with technical guidance



The Importance of Cost-Effective Interventions





Annual Replacement Costs – 35 Year Outlook to Replace Bridges at Age 70 **Millions** \$1,800 **Costs for Bridges Currently Structurally Deficient** or Currently Over 70 are Spread over the Next 25 Years \$1,600 **Needs** \$1,400 \$1,200 \$210M – Peak Annual Bridge **Annual Replacement Construction Funding** \$1,000 \$800 \$600 \$400 \$200 \$-2050 2016 2021 2026 2031 2036 2041 2046 Year

Getting a Good Score

Targeted Repairs





Steel Beam End Repair – During Construction

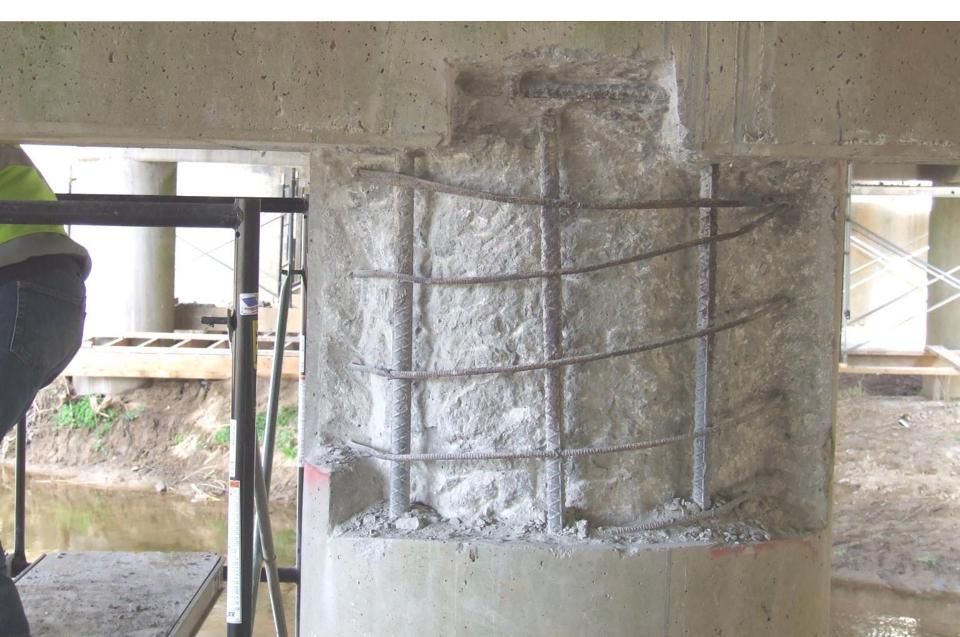


Steel Beam End Repair - Final











Investment Strategies

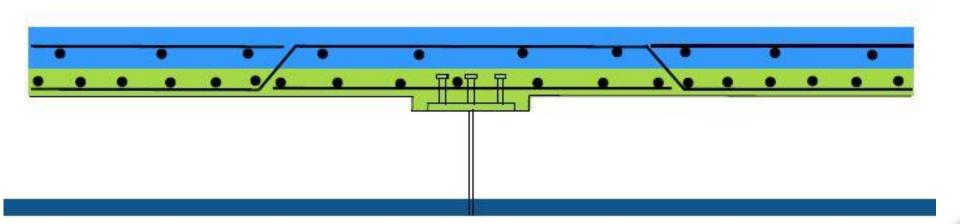
Preservation Strategies







Deep Hydro – Structural Overlay







Deep Hydrodemolition







Eliminating joints by constructing joint closures at piers





Project Examples







I-64 over Shockoe Valley After Overlay



I-64 Over Shockoe Valley Project Summary

Repair and Preservation

Overlay \$6M

Beam Repairs \$2M

Painting \$11M

Substructure Surface Repair \$2M

Joint Elimination \$1M (at a later date)

Total \$22M

Replacement \$125M



Discussion

